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ABSTRACT

A study compared the mean reading abilities of one college's entering freshmen students with the readability levels of several freshman-level mathematics and English textbooks assigned to them. The mean student reading ability was ascertained through an analysis of reading test scores, while text readability levels were determined through the use of five different formulas (those of Dale-Chall, Fry, Raygor, Flesch, and Gunning-Fog). The results showed that students who were reading at or above the mean reading level should be able to cope with approximately 70% of the English texts and 59% of the mathematics books. In general, the different readability formulas yielded similar results. The results also seem to support the implication that authors are currently striving to make textbooks more readable. (A summary of research related to college text readability is included.) (FL)

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A COMPARATIVE STUDY:
COLLEGE FRESHMAN READING ABILITIES
AND
READABILITIES OF REQUIRED TEXTS

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
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Abstract

A study was conducted comparing freshman reading levels to the readabilities of freshman-level mathematics and English texts during the Fall 1982 semester at Kean College of New Jersey. Results showed that students reading at or above the mean reading level should be able to cope with 71.6 percent of the twelve English texts and 58.46 percent of the thirteen mathematics texts. For the most part the five formulae used yielded similar results.

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Books should be a meeting ground of knowledge and a student seeking understanding in a given area of study. A prerequisite to grasping information put forth in a text is the basic ability to decode and comprehend the author's words. A text must be readable for the population expected to absorb its matter.

To a college student a textbook is often the backbone of course work. Selecting a text is crucial to the design of a course of study. The content of a text is important, but the readability of the text is also critical. A student should be able to rely on a text to impart basic knowledge of a subject. However, this may not always hold true. Since the mastery of a course often depends on the student's ability to cope with a text, successful completion of that course may not be possible in the case where text readability is not commensurate with the reading ability of the student. Balser (1976) claims that the difference between reading test scores and text readability correlated significantly achievement test scores and final grades.

In researching this problem, Fox (1977) found that texts assigned to college freshmen were written on a level significantly above their reading levels. In a similar study, Block and others (1976) found that four of the six freshman composition texts they examined were inappropriate for one-quarter of the total student sample.

Lane and Riedler (1980) compared freshman reading abilities with their humanities, science, and social science texts. They found that the science and social science texts were significantly difficult for the students expected to read them.

Further, as Sullivan (1976) found, altho a text may be readable, this readability may apply sporadically. In studying two college freshman texts, she found that the texts ranged from fifth/sixth grade to college graduate reading level.

Since successful completion of course work can depend upon the readability of a text, a key factor in text selection should be its readability. Selectors should become aware of this all-important aspect of a text. Bertalan (1977) polled college instructors and found that they possessed a desire to obtain information prior to the start of each semester on both text readability and student reading levels.

As educators we must continue to probe the appropriateness of the textbooks we expect our students to use. Are the texts that college freshmen are expected to use realistic, taking the readability of the texts and the students' reading grade equivalent into consideration?

Hypothesis

There is a difference of at least one grade level be-

tween texts used in freshman-level mathematics and English courses and the mean reading grade equivalent of freshmen students. The mean readability of respective texts will be higher than the mean reading grade equivalent of the students. The readability formulae used will yield similar results.

Assumptions, Limitations, and Definitions

This study shall be limited to the freshman class of Kean College of New Jersey, Fall 1982 and those texts used in freshman-level courses in the areas of mathematics and English.

Two assumptions shall be made: (1) the readability formulae used are valid and (2) the Nelson Denny Reading Test is valid and reliable.

Readability is calculated with linguistic symbols. Therefore it is neccessary to develop a language suitable for passages given largely mathematically in the mathematics texts. The following is a list of translations to be used in this study.

$\sqrt{\ }$ = the square root of

( ) = the quantity

c = a variable

x+y+z = a variable plus a second variable plus a third variable

= = equals

$\cdot$ = times

$\frac{x}{y}$ = divided by

log = logarithm

3.24 = three point two four

10^n = ten to the unknown power

$<$ = is less than.

PROCEDURES

This is a comparative study; one that takes into account two quite separate groups of facts or data. As such the discussion of things related to data-gathering may appear to be two unrelated processes. This is true. Two separate sequences transpired in the course of this study. Those two shall be referred to as student reading ability and text readability.

Sources of Data

A. Student reading ability

To arrive at the mean student (freshman) reading ability, a computer print-out was used. The data used refers to the results of tests administered to freshmen considering enrollment at Kean College of New Jersey for the 1982 fall semester. The testing was completed between May and August, 1982. The students were tested on many skills in an attempt to determine their preparedness to deal with college study. This study concerned itself only with the scores obtained in the comprehension area. These scores are results of the Nelson Denny Reading Test, Level 13, Form F. Further, this study utilized only the approximately 1,000 scores of freshmen who were accepted and did enroll for the fall semester.

B. Text readability

The actual texts assigned in freshman mathematics and

English courses offered at the freshman level were utilized to determine the mean text readability. In the various sections of those courses offered, there was a total of twelve English texts and thirteen mathematics texts used; these are listed in Figures I and II. This information was readily obtained through use of fall semester registration materials, bookstore records, and records of the Mathematics and English Departments.

Methods of Gathering Data

A. Student reading ability

Two steps were involved in this part of the study. After gathering individual Nelson Denny comprehension scores, they were converted to T-scores. Finally the mean reading level and standard deviation were calculated. These products were used as the basis for comparison to readabilities of the texts studied.

B. Text readability

To determine text readabilities, three 100-word passages were selected from each text. Each passage was subjected to readability formulae tests and the three passages were averaged together for a mean readability for each text. Six readability formulae were applied to each text. The formulae used were those of Spache, Dale-Chall, Fry, Raygor, Flesch, and Gunning-Fog. Finally all of the

Figure I

English Texts Studied

Book No.	Author(s)	Title	Publisher	Date
1.	Marsha Hirsch Cummins Carole Slade	Writing the Research Paper: A Guide and Source Book	Houghton-Mifflin Co.	1979
2.	Randall E. Decker	Patterns of Exposition 8	Little, Brown and Co.	1982
3.	H. Ramsey Fowler	Little Brown Handbook	Little, Brown and Co.	1980
4.	Thomas Friedman James MacKillop	The Copy Book	Holt, Rinehart, and Winston	1980
5.	John C. Hodges Mary E. Whitten	Harbrace College Handbook, Ninth Edition	Harcourt, Brace, and Janovanich, Inc.	1982
6.	X.J. Kennedy Dorothy M. Kennedy	The Bedford Reader	St. Martin's Press	1982
7.	Marie-Louise Matthew Laraine Fergenson	All-In-One	Prentice-Hall, Inc.	1980
8.	Morton A. Miller	Reading and Writing Short Essays	Random House, Inc.	1980
9.	Carole Schoen Elaine Avidon Nila Gandhi James Vaughn	The Writing Experience, Second Edition	Little, Brown and Co.	1982
10.	Michael F. Shugrue	The Essay	MacMillan Publishing Co.,Inc.	1981
11.	Joyce Stith	The Basic Writing Book	Little, Brown and Co.	1982
12.	Suzanne S. Webb	Prose That Works	Harcourt, Brace, and Janovanich, Inc.	1982

Figure II

Mathematics Texts Studied

Book No.	Author(s)	Title	Publisher	Date
1.	Allen R. Angel	A Survey of Mathematics with Application	Addison-Wesley Publishing Co., Inc.	1981
2.	Dennis Bila Ralph Bottorff Paul Merritt Donald Ross	Intermediate Algebra	Worth Publishers, Inc.	1975
3.	Dennis Bila Ralph Bottorff Paul Merritt Donald Ross	Introductory Algebra	Worth Publishers, Inc.	1975
4.	Larry J. Goldstein David L. Schneider	Finite Mathematics and Its Application	Prentice-Hall, Inc.	1980
5.	Mervin L. Keedy Marvin L. Bittinger	Fundamental Algebra and Trigonometry	Addison-Wesley Publishing Co., Inc.	1980
6.	Charles P. McKeague	Beginning Algebra	Academic Press, Inc.	1980
7. 8. 9.	Frederick Mosteller William H. Kruskal Richard R. Link Richard S. Pieters Gerald R. Rising	Statistics by Example Vol. I: Exploring Data Vol. II: Weighing Chances Vol. III: Detecting Patterns	Addison-Wesley Publishing Co., Inc.	1973
10.	J. Louis Nanney John L. Cable	Algebra and Trigonometry: A Skills Approach	Allyn and Bacon, Inc.	1980
11.	Mario F. Triola	Elementary Statistics	The Benjamin/Cummings Co.	1980
12.	Joan Welkowitz Robert B. Ewen Jacob Cohen	Introductory Statistics for the Behavioral Sciences	Academic Press, Inc.	1971
13.	Dennis G. Zill Jacqueline M. Dewar Warren S. Wright	College Algebra and Trigonometry	Wadsworth Publishing Co., Inc.	1979

individual text results were utilized in calculating the mean and standard deviation of their readabilities.

Data-Gathering Instruments

Instruments used in this study included results of Nelson Denny testing and MECC School Utilities, Vol. 2: Finding Readability Levels (1982), used to calculate the readability levels of the texts studied.

RESEARCH RESULTS

Testing Results

As indicated in Table I, scores obtained from the Nelson Denny Reading Test ranged from 72 to 4, with cor-

Table I

Frequency and T-Distribution
of Nelson Denny Test

Score	f	cf	cp	T-score
72	1	990	1.00	-
70	3	989	.999	80.9
68	6	986	.996	76.5
66	13	980	.980	70.5
64	36	967	.977	70.0
62	26	931	.940	65.5
60	49	905	.914	63.7
58	52	856	.865	61.0
56	68	804	.812	58.9
54	80	736	.743	56.5
52	64	656	.663	54.2
50	80	592	.598	52.5
48	81	512	.517	50.4
46	68	431	.435	48.3
44	74	363	.366	46.5
42	45	289	.292	44.6
40	41	244	.246	43.1
38	30	203	.205	41.8
36	26	173	.175	40.6
34	24	147	.148	39.6
32	22	123	.124	38.5
30	23	101	.102	37.3
28	26	78	.079	35.8
26	15	52	.053	33.9
24	9	37	.037	32.1
22	6	28	.028	30.8
20	8	22	.022	29.9
18	6	14	.014	27.9
16	2	8	.008	25.8
14	1	6	.006	24.8
12	2	5	.005	24.6
10	-	5	.005	24.6
8	2	3	.003	22.5
6	-	3	.003	22.5
4	1	1	.001	19.1

N = 990
X = 47.27 ; G.E. = 13.2-13.7
σ = 8.476

responding grade equivalents from third grade to above sixteenth grade. The mean score was 47.27, which on conversion would suggest a grade equivalent of 13.2 to 13.7. When converted to T-scores, where the mean remains 50, that score is equivalent to the raw score 49.35. A difference of a little over two raw score points exists between the two means.

Readability Results

Taking into account all five formulae utilized in the study, the twelve English texts ranged from the sixth grade to college graduate and professional levels as indicated in Table II.

Table II

Readability Results of English Texts

Book No.	Dale-Chall	Fry	Raygor	Flesch	Gunning-Fog
1	13-15	14	12	13-15	15.1
2	11-12	12	*	13-15	16.2
3	11-12	12	12	13-15	15.4
4	9-10	10	10	11	12.3
5	11-12	9	10	10	13.1
6	11-12	11	12	12	16.5
7	7-8	7	7	8	8.2
8	9-10	8	8	8	11.2
9	7-8	7	6	7	7.2
10	9-10	9	10	10	14.3
11	9-10	7	7	8	10.1

Table II (continued)

Book No.	Dale-Chall	Fry	Raygor	Flesch	Gunning-Fog
12	**	16	***	**	19.6

*** = scientific, professional, or technical level
** = college graduate level
* = college level

There is a marked difference between the results of the five readability formulae for most of the twelve texts analyzed with as much as a four year difference between two formulae. Book 1, Writing the Research Paper: A Guide and Source Book, for example, with the Raygor formula was determined to have a readability of twelfth grade, but in the Gunning-Fog, a fifteenth grade level. On the other hand, Book 7, All-In-One, and Book 9, The Writing Experience, were rated within one grade level by all formulae.

The thirteen mathematics texts ranged from readabilities of ninth grade to professional levels as indicated in Table III.

Table III

Readability Results of Mathematics Texts

Book No.	Dale-Chall	Fry	Raygor	Flesch	Gunning-Fog
1	11-12	11	12	11	13.1
2	11-12	13	11	13-15	15.1
3	11-12	9	9	10	13.2

Table III (continued)

Book No.	Dale-Chall	Fry	Raygor	Flesch	Gunning-Fog
4	**	17	*	16	16.8
5	11-12	11	9	12	14.4
6	11-12	9	11	10	12.5
7	11-12	10	12	12	13.9
8	11-12	14	11	13-15	16.4
9	9-10	10	9	11	15
10	11-12	11	10	12	15.2
11	**	17	***	16	16.8
12	13-15	15	***	**	20.4
13	9-10	9	9	10	13

*** = scientific, professional, or technical level
** = college graduate level
* = college level

The largest discrepancy is a six-grade difference between the ninth grade result of the Raygor formula and a result at the fifteenth grade according to the Gunning-Fog in Book 9, Statistics by Example, Vol. III. The smallest difference occurs with Book 1, A Survey of Mathematics with Application. The greatest difference is only the two years between ratings of eleventh and thirteenth grade in this text.

Comparison of Readability Results to the Mean Reading Ability of the Students Tested

Among the English texts, as shown in Table IV, a full half of the twelve texts were clearly above or below the mean reading ability of the freshmen. Five of that half

Table IV

Readability Results of English Texts Proportionate to Mean Reading Ability of Students

Book No.	Percent Below Mean	Percent At Mean	Percent Above Mean
1	20	40	40
2	40	40	20
3	60	20	20
4	100	0	0
5	80	20	0
6	80	0	20
7	100	0	0
8	100	0	0
9	100	0	0
10	80	0	20
11	100	0	0
12	0	0	100
TOTAL	71.6	10	18.3

were all below the mean; one was above. The remaining six texts showed a mixed distribution spread over the three

categories: below, at, or above the mean. When total percentages were calculated, 71.6 percent of the texts were below the mean reading ability of the freshmen. Therefore, it would appear that half of the students (or those reading at or above the mean of 13.2 to 13.7 grade) should be able to read 71.6 percent of those English texts studied.

The results of the mathematics texts were slightly less clear, as can be seen in Table V, with readabilities

Table V

Readability Results of Mathematics Texts
Proportionate to Mean Reading Ability of Students

Book No.	Percent Below Mean	Percent At Mean	Percent Above Mean
1	100	0	0
2	40	40	20
3	80	20	0
4	0	20	80
5	80	0	20
6	100	0	0
7	80	20	0
8	40	20	40
9	80	0	20
10	80	0	20
11	0	0	100
12	0	20	80
13	80	20	0
TOTAL	58.46	12.31	27.69

of only three of the thirteen texts showing results of 100 percent in any one category. Two of those three were below the mean and one was above the mean. Total percentages show that half of the students should be able to read 58.46 percent of the mathematics texts.

When examining the results, as shown in Table VI, ac-

Table VI

Readability Results Proportionate to Mean Reading Ability of Students by Formula

Formula	Percent of Texts Below Mean	Percent of Texts At Mean	Percent of Texts Above Mean
English Texts			
Dale-Chall	83.3	8.3	8.3
Fry	83.3	0	16.6
Raygor	83.3	8.3	8.3
Flesch	66.6	25	8.3
Gunning-Fog	50	0	50
Mathematics Texts			
Dale-Chall	76.9	7.7	15.4
Fry	61.5	7.7	30.8
Raygor	76.9	7.7	15.4
Flesch	61.5	15.4	23.1
Gunning-Fog	30.8	0	69.2

cording to the five formulae, all found that at least 50 percent of the English texts had readabilities below the mean reading ability of the students on the Nelson Denny test.

Among the mathematics texts, all the formulae except the Gunning-Fog found that at least 61.9 percent of the texts had readabilities below the mean reading ability of the students. According to Gunning-Fog the majority of the texts were above their mean reading ability.

CONCLUSIONS AND IMPLICATIONS

The hypothesis that began this study was a threefold one. First, it was hypothesized that there would be a difference of at least one grade level between the mean readability of the texts studied and the mean readability of the texts studied and the mean freshman reading ability. Secondly, in finding this difference, the higher mean, in terms of grade equivalent, would be that of the texts.

As stated in "Research Results" the mean freshman reading ability lies somewhere between a grade equivalent of 13.2 and 13.7; the mean text readabilities, in both English and mathematics, however, were not so clear-cut. Because of the variations stated by the results of the six formulae used, it was only possible to rate texts as below, at, or above the mean student reading ability. Among the English texts, all formulae considered, 18.3 percent of the texts were above the mean student ability; 10 percent were at the mean. As a total that means that all those students reading at or below the mean reading ability (or 50 percent) may not be able to deal with 28.3 percent of those English texts, since a test such as the Nelson-Denny Reading Test measures frustration-level ability. Likewise, with the mathematics texts studied, 27.69 percent of the texts were above the mean student reading ability and 12.31 percent were rated at the mean reading ability. Therefore, a total of 40 percent of the mathematics texts

studied may not be readable by 50 percent of the students. In summary, it is clear that those students reading at, or above the mean reading ability should be able to cope with 71.6 percent of the English texts that were rated below the mean and 58.46 percent of the mathematics texts. This is a clear majority; so these first two parts of the hypothesis are only partially supported and must be rejected.

The third and final articulation of the hypothesis says that the readability formulae used will yield similar results. To a significant extent this hypothesis is supported, with the possible exception of the Gunning-Fog formula which tended to produce a readability different from the other four. This could be seen in the examination of all five formulae in their ratings of below, at, or above the mean student reading ability. For example, in the mathematics texts the formulae all rated 61.5 to 76.9 percent below the mean; the Gunning-Fog found 30.8 percent below the mean, a difference of over 30 percent. An even larger difference occurs when examining the mathematics texts above the mean.

Most of the other four formulae, those of Dale-Chall, Fry, Raygor, and Flesch, rate both mathematics and English texts in the same three categories of below, at, or above the mean student reading ability within 25 percent of each other and considerably less in most instances. It can be

concluded, therefore, that this hypothesis, which states that the formulae will yield similar results, is almost invariably supported by the research data.

Implications

In past research in the same area, many researchers have found college texts to be significantly difficult for students expected to read them. However, in this study it was shown that, altho some of the texts may be difficult for some of the students, they are not significantly difficult for the majority of the population.

In an effort to find what is implied by these results, two possibilities appear obvious. First, it could be likely that college freshman reading ability is, on the whole, improving. Another possibility could be that authors are becoming aware of the need to make their texts more readable for the population for which they are written. This latter seems more likely. As stated by Hinajosa, Miller, and Noyes (1980): "Apparently word has gotten around to the authors of public administration introductory texts about the importance of readability." Perhaps this realization is becoming apparent to authors in other subject areas.

To further support the implication that authors are making their texts less difficult, is the coincidence of copyright dates compared with readability. In this study,

the English texts were clearly more readable that the mathematics texts. It must be pointed out that six of the twelve English were published in 1982. Of the remaining six, five were published in 1980 or 1981; the remaining one was published in 1979. Of the thirteen mathematics texts, which were somewhat more difficult, one was published in 1981, five in 1980, one in 1979, and the remaining six were published before 1975.

It would appear that some college textbooks are becoming more readable. If this is the case, it suggests a positive outlook on the likelihood of more learning taking place since knowledge can now be more easily reached.

READABILITY OF COLLEGE TEXTS: RELATED RESEARCH

In investigating reading, Gray and Rogers (1956) found that reading maturity is not lnly a matter of reading comprohension, but also of other factors that include "the readability and intellectual challenge of materials used." Recent research has taken hold of this and has begun to investigate the readability of texts as a consideration in developing curriculum, as well as a measure of appropriateness of a text for a given population.

Terry Cline (1972) compared student reading abilities to the readability of their texts. Researching at a mid-Missouri community college, Cline found that, according to the Nelson Denny Reading Test administered to 80 percent of the class (N=279), the subjects had a mean reading level of 12.6. The results of readability measurement of 17 texts from varying subjects showed their mean readability to be thirteenth grade, according to the Dale-Chall Readability Formula. In contrasting the students' ability to text readability, at best, eleven of the seventeen texts were too difficult for 50 percent of the students and, at worst, seven of the texts were too difficult for 75 percent of the students.

Four other studies compared the same two factors using the Nelson Denny Reading Test and the Dale-Chall Readability Formula as measurements. Block and others (1976) compared 215 freshman composition students' ability to their six

texts. They found that 72 percent of the students were at or above freshman level. Even given this fact, four of the six texts were inappropriate for one-quarter of the total student sample. Balser (1976) found, in studying reading ability and readability and its effect of college achievement, that students were reading close to their chronological age level; they were able to use their texts on an instructional level. She also noted a significant correlation in the difference between reading test scores and text readability, and achievement test scores and final grades.

In a very similar study at a community college, Bertalan (1976) tested 375 students' ability and found the mean reading level to be 12.44. He applied the Dale-Chall formula to eight textbooks used in nineteen classes of political science, sociology, and psychology. The mean grade level of the texts was 11.3.

Lane and Riedler (1980) compared freshman reading abilities to sixteen texts in humanities, science, and social science. Their 193 student subjects were tested with the Nelson Denny Reading Test; the texts were measured with the Dale-Chall formula. "Results indicated that the science and social sciences were too difficult, since the difference between the means of the two groups was significant. The difference between the means of the students and the humanities texts was not significant."

Keetz (1978) measured the reading levels of students

and the readability of their study habits texts. Utilizing the Davis Reading Test, she examined the reading abilities of 110 students enrolled in reading and study skills classes and 1,145 entering freshman at a state college. She compared the results with the levels of fourteen study habits books, as measured by the Dale-Chall Readability Formula. In contrasting the data, 4.5 to 43.6 percent of the 110 students were below the readability of the books. Keetz noted a significant range of discrepancy on an inter-book analysis. Only one book had a range of less than two grades; the remaining thirteen texts contained discrepancies ranging from five to nine grades. Still, she says, "a disparity exists between the readability levels of books and the reading achievement of a varying number of students who use them."

Fox (1977) also compared college freshman to their texts, using the Flesch Reading Ease Formula and the SMOG Grading Formula. In comparing the students' abilities to their general studies texts, she found that most of the textbooks were written on a level significantly above the reading levels of the students.

Sullivan (1976), using a different research method, analyzed two required freshman texts for readability and cloze performance on selected passages. One cloze passage was administered to 218 students of General Psychology and Principles of Biology. The Dale-Chall formula was separate-

ly calculated for the same passages. In the latter procedure the texts ranged from fifth/sixth grade to college graduate level. The cloze text showed that the selected passages could be read at an instructional level, but 22 percent for one, and 42 percent for the other could be read at an independent level, which, Sullivan says, is usually required.

Osborne and Barnes (1979) conducted a study at a mid-Western state college to compare freshman and sophomore reading levels to the reading levels of their texts and to determine the need for compensatory reading. Starting with a random sample of seventeen percent of each class, they admininstered the Nelson Denny Reading Test to the 92 students willing to participate. The mean reading levels were 13.08 for the sophomores and 12.30 for the freshmen. The Fry formula was applied to a total of 21 textbooks representing each area of the general education curriculum. In comparing levels to textbooks, they placed students in one of three categories: frustrational, instructional, and independent. Both groups of students fell into the independent category for thirteen of the twenty-one books and in the frustrational category for the remaining eight. Osborne and Barnes, analyzing further, found that, as individuals, 43.43 percent of the combined groups were in the frustration category for 38.1 percent of their books. All of these students were reading below college level. The

remaining 56.57 percent of the students were reading at college level and could read 61.9 percent of the books at an independent level. These books were all below college level.

Separating the two classes, Osborne and Barnes found that the reading levels of the freshmen were the worst for comparison of readability to textbooks. A total of 13.4 percent of the freshmen fell into the frustrational category for 100 percent of the textbooks. All were reading below tenth grade level. Of the remainder there were still 20.9 percent in the frustrational category for 76.2 percent of their books. Osborne and Barnes concluded their study by indicating a need for some form of compensatory education.

In a divergently-designed study, Maurice Kurzman (1974) examined and compared college freshmen and their textbooks. As a measure of student ability, the American College Test was utilized. Many students were below thirteenth grade reading ability; the scores ranged from seventh to fourteenth grade. Those below the twentieth percentile were recommended for enrollment in a one-year reading and study skills course. It was these students that became the study sample (N=81). The mean reading level of the group was 10.4; the scores ranged from below seventh to fourteenth grade. The 81 student levels were measured by the Nelson Denny test. As a result of a questionaire completed by the students, 23 social science texts were appraised.

Kurzman's procedures were quite different from those of other studies cited. Rather than solely applying a readability formula, he used five criteria to arrive at text readabilities for the 23 books examined. The five procedires were: formula application (SMOG), estimation by respective course instructors, estimation by two reading specialists, estimation by students, and analysis of other readability aspects by course instructors. The SMOG formula yielded results ranging from thirteenth to eighteenth grade; the reading specialists found the books to range from thirteenth to seventeenth grade and the instructors found them to be from 10.5 to sixteenth grade. Combining the formula, specialists, and instructors, the texts ranged from thirteenth to seventeenth grade. It was noted that the instructors were dissatisfied with the books they were using. The correlation between student and specialist estimates was -.25. The teachers' estimates tended to be slightly the opposite those of the students'. Kurzman accounted for this correlation by noting that the mode was different; the students had no instruction on forming judgements. In the final comparison, Kurzman found the textbooks to be too difficult for self-study, "the main objectives of a college education."

In their conclusions, almost all of the studies ask that text selectors and course instructors place readability near the top on the list of criteria when considering a

text. Evidently college instructors are taking heed of this advice, as there is research to be found in educational and professional/content publications concerning the readabilities of texts utilized in respective college curricula. Most of these studies examine texts used in introductory, or survey, courses.

Patterson (1977) examined the readability, skills, and instructional aids of selected college reading workbooks published between 1970 and 1976. "The findings for readability indicated that college reading workbooks are not necessarily written at college reading level." Readability scores of the 29 books she examined ranged from seventh grade to college. Also, inter-workbook readability varied: some became easier, while others grew more difficult.

Villere and Stearns (1976) sampled 19 organizational behavior texts published between 1964 and 1974, 70 percent of which were published since 1972. Using the Flesch Reading Ease Test, they found the average score was 32. About half of the texts were in the 30-50 range, the span which, according to Flesch's formula, is appropriate for college. Also, according to Duncan's Multiple Range Test, there were statistical differences between and among the texts.

Also utilizing the Flesch formula, Bowman (1977) studied fifteen introductory public administration textbooks published between 1973 and 1977. The mean score was

24.4. He found only three of the texts to be suitable for undergraduates. Most texts had scores in the 20's, a score suitable for graduate studies.

In an update of Bowman's study, Hinajosa, Miller, and Noyes (1980) found that more recent public administration texts are becoming more appropriate. They say, "apparently word has gotten around to the authors of public administration introductory texts about the importance of readability."

Gallagher and Thompson (1981) applied the Flesch test to fifteen introductory economics textbooks. They found that the samples varied widely; the range of the texts was from ninth grade to advanced undergraduate level. They stress that a formula only measures a small aspect of readability.

Dukes and Kelley (1979) applied the Flesch formula to some elementary astronomy and noncalculus-level physics texts published in the mid-70's. They found that "most texts seem to be written at a level appropriate to college freshmen." Results ranged from ninth grade (only one text) to college junior level. In concluding they felt that formulae information "should not count more that 20-25 percent toward the choice of a text."

Summary

Based on the research presented, it is clear, with one or two exceptions, that many texts are too difficult for many beginning college students. In ten comparison-type studies, all but one finds that many texts are written at an inappropriate level. An exception was Balser's study where it was found that the sample was able to read the texts at an instructional level. Sullivan, however, claims that this level is not sufficient. She states that, at the college level. independent reading ability of a text is usually required. Another exception was one-third of the texts sampled by Lane and Riedler. They found that their student sample was able to cope only with the humanities texts examined in their study.

A point to magnify the findings of the majority of researchers who found texts to be too difficult is to be seen in the nature of the standardized tests that they utilized to gauge the abilities of the student samples. The tests, as do most tests, measure the frustrational level of the test-taker. Given this fact, the texts may appear even more difficult in comparison with the student samples. Furthermore, given the self-study nature of the traditional college setting, it is highly unlikely that a student would be able to deal with a text barely readable at a frustrational level.

A few of the researchers noted discrepancies within the texts studied. Perhaps this is part of the reason that, in nearly all of the comparative research, a recommendation was made for more studies of the same nature.

In the non-comparison research it is clear that the range of texts to be found in a given subject area can be large. Perhaps this is a positive effect that may allow instructors to choose a text at any number of levels of readability, altho most did not mention if the range appeared on intra- or inter-book occassions. Dukes and Kelley stated that their texts seemed to be appropriate. However, this was stated without consideration of the possible populations which may utilize the texts.

What ever their results, it is heartening to see evidenced that college instructors, not only reading professionals, are becoming aware of this aspect of course work. And lastly, they are cognizant of the fact that readability formulae only measure one consideration of readability. The majority of these researchers point out that the methods they used should not be the only basis for selection of a text.

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